# *Sarracenia flava* Varieties: Do We Know What We, Are Talking About?

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Hardly a month goes by that I do not receive requests for seeds or plants of various *Sarracenia flava* "varieties", such as v. *rugelii* or v. *crispata*. The correspondent seems somewhat stunned when I write back asking them for a description of what they want. They seem confused that I may not be acquainted with these "well-accepted" varieties.

As often happens over time and many writings and rewritings, the various varietal terms have become confused, sort of like the classic game where a line of students whispers something in the ear of a neighbor and asks them to repeat it down the line, and what comes out is often quite different from what started at the other end.

The start is mainly a paper written by M. T. Masters for The Gardeners' Chronicle, a British publication, in 1881. The "other end" is probably assumptions based on difficulties in making Latin translations from Macfarlane's Das Pflanzenreich monograph of 1908, and the general unavailability of Masters' original article.

I thought it would be useful to review what Masters meant by these different varieties, if we could figure it out from his descriptions. Some of you will not be pleased with the results since they are quite at odds with many common assumptions. We can only blame McDaniel for one thing in his 1966 doctoral dissertation, and that is a typo wherein he called Masters' v. *atrosanquinea* v. *atropurpurea* , so we can strike *atropurpurea* right now. Macfarlane named a new variety, v. *media* , in his monograph. Translated from the Latin, he describes "a pitcher of medium stature, throat dark red with red veins radiating out". This actually sounds rather uninteresting and nondescript. I think this is likely one of the hybrids between the primary five variants on the Carolinas coastal plain (e.g. Schnell, 1978), and so we can drop that one. I would be especially cautious of using "small, medium and large" in describing *S. flava* variants since size among them is so much a function of age and growing conditions.

McDaniel does not describe any variants in his monograph but merely lists them. Macfarlane offers abbreviated descriptions from Masters but they are in Latin as is his entire monograph. So we must go back to Masters in 1981 to look at some of the most prominent variants.

var. *ornata* — This epithet is rather descriptive in that it is indeed, in my opinion, one of the most ornate pitchers. "..a rather large form with green pitchers traversed with red veins, the inner surface of the large lid being especially marked with a network of red veins..." This sounds a lot like the heavily veined form of the Carolinas coastal plain. But, one wonders about the degree of venation, although he uses "especially", which is helpful. I underlined marked for a special reason to be discussed later. So, I think this one is pretty clear-cut, and nicely matches his Fig. 3 as the heavily veined variant.

var. *rugelii* — "One of the large forms, with the lid of the pitcher well marked (underline mine) and strongly blotched with crimson at the base." This is one of the most popularly discussed variants, and is usually referred to the Gulf coastal plants which have a large, unveined yellow-green lid, purple blotch in the throat and no or few

veins in the pitcher. These are probably *not* the same! Notice that he describes the lid as "well marked". Now, does well marked mean with veins (as in the clearly "marked" I underlined in var. *ornata*) , or does it mean marked in the sense of large, prominent, etc. Since Masters has already used "marked" to mean marked by veins, then the Gulf coastal plants are clearly not var. *rugelii*! We should probably stop using that epithet for the Gulf plants.

Curiously. Macfarlane adds to the confusion by an omission: "Folia magna, fauce ascidii et basi operculi purpurea." Translated, "Leaf large, throat of pitcher and base of lid deep red." He forgot the "well marked"

var. *maxima* — This seems easy—Maxima means "large", so this probably means any large, typical *S. flava* that one finds in the Carolinas piedmont, for instance. Right? Wrong! "...differs only...in the pitchers, and their lids, being wholly green." So, var. *maxima* is our all-green variant of the Carolinas coastal plain; nothing really to do with size!

var. *crispata* — "...very remarkable variety ... green with prominent nerves(he means red venation), and with deeper wing ... strongly reflected sepals, the white (underline mine) petals, ...blunter ovary ... lid erect, incurved, ovate acute or tall-pointed, contracted at the base." What does it sound like?-*S. alata* , of course! So that eliminates var. *crispata* Masters *sensu stricto*. In all fairness, Masters does wonder in writing if this might not be a separate species.

var. *atrosanguinea* (probably incorrectly McDaniel's listed var. *atropurpurea* referred to the Masters article we are quoting) - "..relatively small form...lid ovate-acute, deeply stained wit red." Then he refers to his Fig. 4, which is obviously one of the *S. rubra* sspp. The written description is obviously rather vague, and I think most people referred this variant name to the all-red form of the Carolinas coast, because of what the name sounds like, really pushing redo So, we can drop this one, too.

I think the main lesson of all this is to go back to original literature as much as possible. In this case, it is relatively easy since we all have access to libraries directly or through interlibrary loan. In other problem areas, such as looking for the types of *Sarracenia purpurea* or *Drosera anglica* , it is far from easy!

We must also realize that Masters was writing from Britain in the latter 19th century and had only experienced *S. flava* from horticultural specimens and a few herbarium sheets. A great deal of field experience is necessary to even begin to appreciate the polymorphism of this species.

A second lesson may be that little is as it seems. var *maxima* may be small or large, but the key factor is its all-green pitcher color in the original description. Perhaps it is also somewhat disappointing that McDaniel did not address these variants at all in his easily accessible monograph which seems to be widely distributed.

## LITERATURE CITED

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# Photosynthetic Inorganic Carbon Use by Aquatic Carnivorous Plants

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Photosynthetic uptake of inorganic carbon by submerged aquatic plants is limited mostly by the concentration of inorganic carbon and light availability. It is generally accepted that aquatic plants compete for inorganic carbon and that use of $HCO_3^-$ as a carbon source is ecologically advantageous in standing waters (Allen and Spence, 1981; Maberly and Spence, 1983). $CO^2$ concentration in waters depends strongly on pH, according to the following equation (Helder, 1988):

$$pH = 6.37 + \log ([HCO_3^-] / [CO_2]).$$

Thus. the lower the PH is at a given total alkalinity (TA),

$$TA = [HCO_3^-] + 2.[CO_3^{-2}] + [OH^-] + [H^+]),$$

the higher is the $CO_2$ concentration in water.

The majority of aquatic carnivorous species usually grow in soft or medium-hard, acid or neutral, dystrophic waters; but some species of *Utricularia* may grow in hard and slightly alkaline waters (Komiya, 1966; Moeller, 1978; Kadono, 1982; Fraser et al., 1986; Arts and Leuven, 1988; Hough and Fornwall, 1988). These species can grow in waters that differ widely in TA and pH conditions (Kadono, 1982; Fraser et al., 1986; Arts and Leuven, 1988) and at very different $CO_2$ and $HCO_3^-$ concentrations. Aquatic plants are plastic concerning their photosynthetic affinity for $CO_2$ and $HCO_3^-$ and are able to change the affinities according to the ratio of $CO_2/HCO_3^-$ concentrations in water (Sand-Jensen and Gordon, 1986). In studies performed so far, *Utricularia purpurea* (Moeller, 1978) and *U. vulgaris* (Hough and Fornwall, 1988) were found to use only $CO_2$. Aquatic carnivorous plants either have strict or facultative requirements for organic substances in water (Ashida, 1937). These substances enhance plant growth substantially while some of the organic compounds used by the plants are taken up from water, and the plants probably also use organic compounds derived from prey bodies (for a review see Lüttge. 1983, p. 492-493; Juniper et al., 1989: p. 131). In this paper, three European aquatic *Utricularia* species and *Aldrovanda vesiculosa* were tested for $HCO_3^-$ use and $CO_2$ affinity,
*Utricularia australis* R.Br. and *U. minor* L. were collected from sites in the Ceska Lipa